INTERNATIONAL HIGHER SCHOOL OF MEDICINE
Department of Public Health

SYLLABUS
Microbiology, Virology and Immunology

2025-2026 academic year
for students of medical faculty
2 course 3semester
3 credits (90h, including auditirial-54h, independent work-36h)

Central campus
Lecturer:
3 semester, all groups

Central campus

Practical classes:	**Sulaimanova Cholpon,** MD, PhD, Associate Professor +996 553409666 (WhatsApp) Email: cholponsul@mail.ru
3 semester, groups # 1,2,3,4,5	
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Venue: Central campus:114/1 Lev Tolstoy st. the first and second floor, room numbers: 201, 202, 203, 208 and 209

The Syllabus is considered
at the meeting of the department of Public Health
Protocol №1 dated 28.08.2025

Head of the department _____K.O. Dzhusupov

Course objective: to expand understanding of the interaction between microorganisms and the body, master laboratory diagnosis of infectious diseases, and integrate modern microbiological knowledge to develop clinical thinking skills in future physicians.

After study of the discipline the student must:
Knowledge: to impart knowledge of the structure and form of bacterial cells with the function of various formations, their chemical composition, physiology, bacterial biochemistry, characteristics of nutrition, respiration, growth, and reproduction.
Skill: Acquire requisite skill in observing sanitary-hygienic and epidemiological rules and safety techniques in bacteriological laboratories. Have skills in differentiating microorganisms based on morphological characteristics under microscopy and skills in the differential diagnosis of pathogens based on morphological characteristics.
Attitude:
Prerequisites: Medical Biology, Macro- and Microanatomy, Normal Physiology, Pathology (Pathological Anatomy and Physiology), Propedotherapy, Propaedpediatrics.
Post-requisites: Clinical Modules, Operative Surgery, Ophthalmology, Oncology, Dermatovenerology, Dentistry, Phthisiopulmonology, Otorhinolaryngology, Traumatology, Orthopedics, Extreme Surgery, Public Health and Health, Family Medicine, Pediatric Infectious Diseases, Infectious Diseases, Epidemiology, Polyclinic Therapy, Clinical Allergology and Immunology, Resuscitation and Intensive Care Medicine, Polyclinic Obstetrics and Gynecology, Polyclinic Pediatrics, Polyclinic Surgery.

THEMATIC PLAN OF LECTURES

№	Topic of lecture for 3rd semester	Hs	Date
1	The subject and tasks of medical microbiology, virology, and immunology: history of microbiology, modern aspects, notable scientific contributions, and the role of microbes in health and disease	2	01.09.2025
2	Principles of a bacteriological laboratory: structure, organization, and biosafety regulations	2	15.09.2025
3	Morphology and ultrastructure of bacteria: structural characteristics, classification, and clinical significance	2	29.09.2025
4	General characteristics of microorganisms: morphology, physiology, classification, and common infections caused by bacteria, viruses, and fungi	2	13.10.2025
5	Physiology of microorganisms: chemical composition, nutrition, and respiration	2	27.10.2025
6	Physiology of microorganisms: reproduction, growth, and metabolism	2	10.11.2025
7	Principles and methods of cultivation of bacteria and viruses: culture media, techniques, and conditions	2	24.11.2025
8	Genetics of microorganisms and viruses: heredity, variation, and genetic mechanisms	2	08.12.2025
9	Ecology of microorganisms and sanitary microbiology: microbial interactions, public health importance, and sanitary evaluation methods	2	22.12.2025
	Total	**18**	

THEMATIC PLAN OF PRACTICAL CLASSES

Unit	Topic of the practical class for 3 semester	Hs	Date
Unit 1 — Introduction to General and Applied Microbiology: Laboratory Organization and Methods of Identification	General and applied microbiology: organization of the microbiology laboratory, principles of biosafety, laboratory safety rules, and historical milestones with contributions of key scientists in medical microbiology	2	01.09.2025-06.09.2025
	Laboratory equipment and PPE: use of laboratory tools, compliance with PPE, emergency procedures, research methods in microbiology; types of microscopes, principles of operation, and laboratory methods for detecting causative agents of infectious diseases	2	08.09.2025-13.09.2025
	Identification methods of microorganisms: immersion microscopy, smear preparation, simple staining techniques, and discussion of the role of microbes in health and disease	2	15.09.2025-20.09.2025
	Morphology of microorganisms: structural features of bacteria, fungi, and intracellular parasites (protozoa, rickettsiae, mycoplasmas, chlamydiae, viruses)	2	22.09.2025-27.09.2025
	Structure of the microbial cell: complex staining methods, visualization of inclusions (volutin granules), sporulation and spore staining, capsule detection, and motility; practical skills include Gram and Ziehl–Neelsen	2	29.09.2025-04.10.2025

	staining, stool examination, identification of *Staphylococcus* spp., and discussion of culturing *Mycobacterium tuberculosis*		
	Unit 1 test	2	06.10.2025-11.10.2025
Unit 2 — Microbial Physiology: Nutrition, Respiration, Enzymes, and Cultivation Methods	Microbial physiology: types of bacterial nutrition, classification and preparation of nutrient media, and microbial reproduction	2	13.10.2025-18.10.2025
	Bacterial respiration: aerobic and anaerobic types and classification	2	20.10.2025-25.10.2025
	Cultivation and isolation of pure cultures: aerobic and anaerobic methods	2	27.10.2025-01.11.2025
	Bacterial enzymes and metabolism: classification, protein metabolism, significance and study methods, pathogenicity of enzymes, and the role of bacterial pigment formation	2	03.11.2025-08.11.2025
	Methods for studying enzymatic activity: biochemical reactions on Giss and MacConkey media, evaluation of pigment formation	2	10.11.2025-15.10.2025
	Unit 2 test	2	17.11.2025-22.11.2025
Unit 3 — Virology and the Infectious Process: Sterilization and Infection Control	Viruses and bacteriophages: morphology, classification, replication, and genetics of microorganisms	2	24.11.2025-29.11.2025
	Sterilization and disinfection: classification, mechanisms of action, applications in laboratory and clinical practice, quality control, demonstration of hand hygiene, donning/doffing PPE, and biomedical waste management	2	01.12.2025-06.12.2025
	Infection and infectious process: factors of virulence and pathogenicity, routes of transmission, epidemiological basis, molecular mechanisms of pathogenesis, and laboratory diagnosis of opportunistic infections; interpretation of microbiological test results in clinical practice	2	08.12.2025-13.12.2025
	Nosocomial infections and infection control: ecology of microorganisms, sanitary microbiology, causative agents and types of healthcare-associated infections (HAI), chain of transmission, infection prevention, precautions, and the role of the Hospital Infection Control Committee (HICC)	2	15.12.2025-20.12.2025
	Collection, storage, and transportation of clinical specimens: correct methods of specimen collection and transport, patient instructions, demonstration of procedures, and professional attitudes in handling clinical material for microbiological diagnosis	2	22.12.2025-27.12.2025
	Unit 3 test	2	29.12.2025-03.01.2025
	Total	**36**	

THEMATIC PLAN OF INDEPENDENT WORK OF STUDENTS

№	Unit №	Theme of independent work	Hours
1	General Microbiology. Microbiology laboratory. Microorganisms` morphology	1. Compilation of 10 test tasks on the unit topic 2. Compilation of a glossary on the subject “Medical Microbiology”. 3. Compose a crossword puzzle on the topic of the lesson. 4. Drawing up a summary of the requirements for organizing a bacteriological laboratory. 5. Preparation of slide presentations on the topic of the unit. 6. Draw a poster on one of the topics below: *a.* Standard microbiological laboratory. *b.* Biological safety of a microbiological laboratory. *c.* Basic forms of bacteria. *d.* The structure of a biological microscope.	12
2	Physiology of microorganisms	1. Compilation of 10 test tasks on the unit topic 2. Compilation of a glossary on the subject “Physiology of microorganisms. Immunity: structure and functions." 3. Compose a crossword puzzle on the topic of the lesson. 4. Compilation of a summary of the physiology, biochemical processes and types of respiration of microorganisms. 5. Preparation of slide presentations on the topic of the unit.	12
3	Microbial and viral genetics. Infections and	1. Compilation of 10 test tasks on the subject. 2. Compiling a glossary on the subject of the block. 3. Compiling a crossword puzzle on the subject of a unit.	12

	Infection Control. Microbial Ecology	4. Compiling an abstract on the subject of the block. 5. Preparation of a slide presentation in Power Point format on the topic of the device. 6. Draw a poster on one of the topics below: *a.* Virus structure. *b.* Gene and gene code. *c.* Infection process and infection control *d.* sterilization, disinfection, asepsis, antiseptics. *e.* Hand washing algorithm. *f.* Antibiotic resistance.	

Recommended reading for the discipline:

Basic: 1. Ananthanarayan and Panikers "Textbook of Microbiology" 7-th (2008), 9-th (2016), 10-th (2018) editions,
2. James G. Cappuccino, Natale Sherman "Microbiology: a laboratory manual" 10-th edition (2014) (https://themodern.farm/studies/Microbiology-Laboratory-Manual.pdf),
3. Arvind Arora "General Microbiology" Pulse Publications (2010) (https://context4book.com/download/4705487-arvind-arora-microbiology).
Additional: 1. Warren Levinson Ernest Jawetz **"**Medical Microbiology and Immunology**"** 6-th edition (2000),
2. Abilo Tadesse, Meseret Alem "Medical Bacteriology" Ethiopia Public Health Training Initiative (2006), (https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_occupational_health_students/medicalbacteriology.pdf),
3. F.H. Kayser, K.A. Bienz, J.Eclert, R.M.Zinkernagel "Medical Microbiology" Thieme (2005), (https://repository.poltekkes-kaltim.ac.id/1153/1/medical%20microbiology.pdf),
4.Keith Struthers "Clinical Microbiology" 2-nd edition (2017), (http://repository.stikesrspadgs.ac.id/25/1/Clinical%20Microbiology%20Struthers-299hlm.pdf)

Grading policy and procedures for all types of work

For the period of studying the discipline, the student gains points for the relevant parameters (per unit):
current score - 40 points
independent work - 20 points
control score (final assessment of knowledge per unit) - 40 points
Maximum score - 100 (40+20+40)

Grading system for student's achievements

Grading criteria per discipline				
Maximum score	Intervals			
	«unsatisfactory»	«satisfactory»	«good»	«excellent»
Current control - 40	0-23	24-30	31-35	36-40
Interval description	Doesn't do homework ; Does not answer 3 questions asked, has difficulty working with situational tasks, lacks knowledge and practical skills when working in a microbiological laboratory	Does not complete homework in full : answers one question out of three ; has gaps in mastering the material; has difficulty applying knowledge in practice ; partially understands the text, but incompletely and inaccurately answers the teacher's questions when solving situational problems	Completes homework in full : answers two or more questions ; material, but sometimes experiences difficulties and makes mistakes when performing practical procedures ;	Completes homework in full , answers three or more questions ; easily applies knowledge and skills when solving problems of various types, can sometimes make mistakes , clearly follows practical procedures (1.2);
Independent work - 20	0-11	12-15	16-17	18-20
Interval description	There is no IW or the content does not correspond to the stated topic, but the sequence of presentation is broken; the material	The content partially corresponds to the stated topic; the sequence of presentation is broken; Low quality material,	The content of the presentation, assignments, tasks correspond to the stated topic; clearly, clearly and	The content of the presentation, confederates, corresponds to the stated topic; clearly, clearly and

	used is of low quality, sources are not indicated	no sources indicated. Less than three tasks out of five were completed incompletely	consistently presented; good quality material, more than four tasks completed	consistently presented; good quality material, presented in full: sources indicated, all stated tasks completed
Control work (module) - 40	0-23	24-30	31-35	36-40
Interval description	The student has gaps in knowledge, correctly answering less than 23 out of 40 questions during testing.	The student has a basic understanding of the study material within the program, correctly answering questions 24 to 30 out of 40 (answering correctly less than 60%).	The student fully comprehends the study material provided by the program, correctly answering questions 31 to 35 out of 40 (answering correctly less than 77%).	The student demonstrates a deep, substantive, and comprehensive understanding of the program material at a high scientific level, correctly answering questions 36 to 40 out of 40 (answering correctly more than 90%).

Conduct Policy: (lateness, absence, behavior in the auditorium, late submission of work).

- Punctuality and completion of tasks.
- Mandatory attendance of classes.
- Attending class in a clean medical uniform.
- Eliminating conversations on a cell phone in the classroom.
- Active participation in the learning process.
- Doing homework on time.
- Academic detention at the time specified by the teacher.

For violations of the Conduct Policy, the total points for discipline might be reduced to 1-10 points.

Academic Ethics Policy.

- Be tolerant, respect the opinions of others.
- Formulate objections in the correct form.
- Constructively support feedback in all classes.
- Plagiarism and other forms of dishonest work are unacceptable. Plagiarism includes the following: the absence of references when using printed and electronic materials, quotes, thoughts and works of other authors or students.
- Prompting and cheating during tests, exams, classes is unacceptable as well as passing an exam for another student, unauthorized copying of materials.

For violations of the Academic Ethics Policy, the total points for the discipline may be reduced to 1-10 points.

Guidelines for the lessons of the discipline

Lectures for 3 semester

Key questions covered in Lecture 1.

1. Microbiology as a science (definition, types of microbiology).
2. The history of the development of microbiology, the contribution of scientists.
3. Principles of classification of microorganisms.
4. Classification of bacteria, viruses: taxonomy and nomenclature.
5. The main forms of microbes.

Recommended reading for the lesson:

1. General Microbiology/ Arvind Arora.- Pulse Publications.- 2010.- c. 6-32.
2. Medical Microbiology.4th ed.BaronS,Galveston (TX):University of Texas;1996. ISBN-10:0-9631172-1-1
3. (Textbook of Microbiology. Third edition. By prof. C.P.Baveja/ Arya Publications.-2010.- 618 p.) раздел 1.
4. Textbook of Microbiology. Seven edition. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. - India, 2006.-c. 1- 89.

Key questions covered in Lecture 2.

1. Morphology of Procaryotic & Eucaryotic Cells
2. Bacterial cell structure, shape, arrangement
3. Cell wall structure
4. Staining: Gram's stain, Acid-fast Stain
5. Rickettsias, Chlamydias and Mycoplasmas

Recommended reading for the lesson:

1. Microbiology for pgmee. General Microbiology/ Arvind Arora. - Pulse Publications.- 2010, p 6-32.

2. Textbook of Microbiology. General Microbiology. Third edition. By prof. C.P. Baveja/ Arya Publications. - 2010.- p. 1- 89.
3. Practical Microbiology. D.R. Arora/ CBS Publishers &Distributors/- New Deli. Bangalore, 2007, 218 p.
4. Textbook of Microbiology. Seven edition. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. - India, 2006 .-657 p.
5. The Microbiology coloring book by I. Edward Alcamo Lawrence M. Elson. - Benjamin Cummings, New York,1996.

Key questions covered in Lecture 3.
1. Growth and multiplication of microbes (generation time, multiplication phase, etc.).
2. Types and mechanisms of feeding microbes.
3. Respiration of microbes, its types.
4. Enzymatic activity of microbes, pigmentation, glow of bacteria. Methodsofstudy.
5. Features of virus multiplication, the interaction of the virus with the host cell.
6. Virogenia. Defective viruses. Bacteriophages.
7. Principles and methods of cultivation of bacteria and viruses

Recommended reading for the lesson:
1. Microbiology for pgmee. General Microbiology/ Arvind Arora. - Pulse Publications. - 2010, p 6-32.
2. Textbook of Microbiology. General Microbiology. Third edition. By prof. C.P. Baveja/ Arya Publications. - 2010.- p. 1- 89.
3. Review of Medical Microbiology and Immunology. Tenth edition. Genetics. / Warren Levinson. - a LANGE medical book.
4. Textbook of Microbiology. Seven edition. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. -India, 2006.-657 p.
5. Clinico-Basic Microbiology. 3rd revised edition. By Dr. Muhammad Shamim. - Publisher Khurram&Brothers, 2004.-187 p.

Key questions covered in Lecture 4.
1. Genetics, definition. Genetic information in microorganisms (DNA, RNA, gene, genome, replicon, etc.).
2. Variability of microbes, mutations, their classification, mutagens, plasmids, episomes, their role.
3. Gene expression. Transmission of genetic material. Genetic recombinations. Factors of the bacterial.
4. Basic concepts of genetic engineering, practical importance. Genetic mapping.

Recommended reading for the lesson:
1. General Microbiology/ Arvind Arora. Pulse Publications. - 2010p. 6-32, 131-309.
2. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson. - LANGE med.book. p. 1-101.
3. Textbook of Microbiology. 3rd ed. By prof. C.P.Baveja/ Arya Publications. 2010 p. 1-191.
4. Textbook of Microbiology. 7th ed. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. India, 2006. p. 51-63.

Key questions covered in Lecture 5
1. Morphological features of chlamydia (structure, life cycle, staining and cultivation, species, epidemiology, pathogenicity, resistance).
2. Morphological signs of rickettsia (structure, life cycle, staining and cultivation, species, epidemiology, pathogenicity, resistance).
3. Morphological features of mycoplasmas (structure, life cycle, staining and cultivation, species, epidemiology, pathogenicity, resistance).

Recommended reading for the lesson:
1. Medical Microbiology and Immunology. 6th ed. Warren Levinson, Ernest Jawetz Med. Books 2000, p. 38, 121-123, 128-129, 130-133.
2. Textbook of Microbiology. 7th ed. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. -India, 2006. P. 425-428.
3. Microbiology /Tamil Nadu Text Book Corporation, 2004. p. 30-32. Rickettsia, Chlamydia, Mycoplasma - ATSU.
4. https://www.atsu.edu/faculty/chamberlain/.../lects/rickett.htm

Key questions covered in Lecture 6
1. Pathogenicity and virulence of micro-organisms, toxigenicity.
2. Mechanisms and factors of transmission of infectious agents. Forms of infection.
3. Role of opportunistic microflora in human pathology.
4. Hospital-acquired infections.
5. Prevention and control.

Recommended reading for the lesson:

1. Lecture notes on Infections Diseases. Sixth edition. By B.K.Mandal and all./ Blackwell Publishing Ltd, 2005.- 267 p.
2. Microbiology for pgmee. By Arvind Arora. - Pulse Publications. - 2010, pp 6-309.
3. Microbiology for the Health Sciences. Fifth edition. By prof. Gwendolyn R.W. Burton, Paul.G.Endelkirk.- Lippincott.-
Philadephia, New York, 1996, 444 p.

Key questions covered in Lecture 7

1. Immunology and Immune System
2. Types of immunity
3. Antibody Structure and Function
4. Antibody Classes and Biological Activities

Recommended reading for the lesson:

1. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages 85-89, 94-99, 122-124, 143-148.
2. Hawley, Louise. Microbiology and Immunology, 6th ed. / pages 238-257.
3. Anantharayan and Paniker's «Textbook of Microbiology» 7th ed. / pages 71-80, 152-158.
4. Medical Microbiology. 26th.edition, 2013, Jawetz, Melnick, & Adelberg's. - LANGE medical book.- p.123-124, 124-140, 142-143.
5. Kim Moscatello, Immunoogy and Microbiology, Kaplan Medical USMLE Step1, lecture notes,2013/ pages 2-22, 117-131.

Key questions covered in Lecture 8

1. Introduction of Immune response.
2. Humoral Mediated Immunity (HMI)
3. Production of Antibodies
4. Primary and Secondary Response
5. Cell Mediated Immunity (CMI)

Recommended reading for the lesson:

1. Subhash Chandra Pariga «Textbook of Microbiology & Immunology»2nd edition, 2012/pages 88-89, 134-142.
2. Hawley, Louise. Microbiology and Immunology, 6th ed. / pages 263-273.
3. Anantharayan and Paniker's «Textbook of Microbiology» 7th ed. / pages 133-151.
4. Medical Microbiology. 26th.edition, 2013, Jawetz, Melnick, & Adelberg's. - LANGE medical book.- p.124-140, 144.
5. Kim Moscatello, Immunology and Microbiology, Kaplan Medical USMLE Step1, lecture notes, 2013/ pages 67-101

Key questions covered in Lecture 9

1. Antigens.
2. Immune response
3. Antigen-antibody reactions. Serological reactions
4. Serological methods of diagnosis immunological processes.

Recommended reading for the lesson:

1. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages 90-93, 101-115
2. Hawley, Louise. Microbiology and Immunology, 6th ed. / pages 238-251, 252-254.
3. Anantharayan and Paniker's «Textbook of Microbiology»7th ed. / pages 92-110.
4. Medical Microbiology. 26th.edition, 2013, Jawetz, Melnick, & Adelberg's. - LANGE medical book. - p.143-144.
5. Kim Moscatello, Immunology and Microbiology, Kaplan Medical USMLE Step1, lecture notes, 2013/ pages 171-184.

Unit 1

Key questions covered in lesson 1.

1. Wtat are Laboratory Safety Rules?
2. Why is lab safety important?

3. Reasons to Prioritize Lab Safety
– Prevents Accidents and Injuries
– Promotes Safe Handling of Hazardous Materials
– Keeps Operations Running Smoothly
– Ensures Proper Use of Laboratory Equipment
– Ensures Workers Stay Safe in Hazardous Environments

4. Common Lab Safety Rules
– Be Aware of All Potential Hazards
– Know the Location and Proper Use of Lab Safety Equipment
– Handle Chemicals With Care
– Prevent Cross-Contamination

– Keep the Environment Clean and Controlled
– Wear Protective Gear
– Have Emergency Phone Numbers Posted in Plain Sight

Recommended reading for the lesson:

1. General Microbiology/ Arvind Arora.- Pulse Publications.- 2010.- c. 6-32.
2. Medical Microbiology.4th ed.BaronS,Galveston (TX):University of Texas;1996. ISBN-10:0-9631172-1-1
3. (Textbook of Microbiology. Third edition. By prof. C.P.Baveja/ Arya Publications.-2010.- 618 p.) раздел 1.
4. Textbook of Microbiology. Seven edition. By Ananthanarayan and Paniker`s/ Orient Longman Private Limited. - India, 2006.-c. 1- 89.

Key questions covered in lesson 2.

1. Microbiology lab equipment list What are the common equipment of microbiology lab?

Autoclaves, UV chambers, laminar flow hoods, biosafety cabinets, incubators, deep refrigerators, centrifuges, and microscopes are all essential pieces of microbiology lab equipment.

2. The rules for using PPE include the following:

Know which PPE is required for your work role. This can include the following: gloves, safety glasses, steel-toed shoes, earplugs or muffs, hard hats, coveralls, and others.
Use the PPE in the manner you have been trained to use it.
Ensure your equipment fits comfortably. Items that are too big or too small could expose you to danger.
Be fully trained in the use of your specific PPE. This includes when to use it, what type is required for specific jobs, how to properly wear and take it off, as well as the limitations of the equipment.
Do not misuse or damage the clothing you have been provided.
Ensure proper care and maintenance of the PPE.
Notify your employer immediately if you notice any damage or malfunction, or if you need to clean or sterilize the PPE.

3. Emergencies in the lab. What are the risks in microbiology lab?

Biological hazards may be contained in tissue samples, body fluids, cultures, and animals. Bloodborne pathogens, such as HIV and hepatitis B virus, are a special category of biological hazards. Common chemical hazards are carcinogens, toxins, corrosives, and irritants.

4. Research methods in microbiology.

The fundamental microbiology laboratory techniques include aseptic techniques, culturing techniques, enumerating bacteria, and identifying different classes of microorganisms. These techniques form the base of advanced research and experiments performed on microorganisms.

5. Types of microscope

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 8
2. Michel J. Leboffe, Morton Publishing Company/ Microbiology-Laboratory Theory and Application/ - 2010, p. 3-9
3. A Manual Basis Practical Microbiology, Society for General Microbiology, 2006/p. 1-5
4. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014/p.6-8

Additional:

1. Microbiology Lab Manual by Cynthia Schauer. Virtual Microbiology Class of the Science Prof Online website.
2. List of equipment in microbiology laboratory. Adana Science and Technology University-Bioengineering Department/ http://bioeng.adanabtu.edu.tr/upload/menu/doc/pdf.- p. 1-13

Key questions covered in lesson 3.

1. Methods of identification of microorganisms
2. Principles of work an immersion microscope
3. Smear preparation
4. Simple staining

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson. - LANGE med.book.- c. 8
2. Michel J. Leboffe, Morton Publishing Company/ Microbiology-Laboratory Theory and Application/ - 2010, p. 3-9
3. A Manual Basis Practical Microbiology, Society for General Microbiology, 2006/p. 1-5
4. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014/p.6-8

Additional:

1. Microbiology Lab Manual by Cynthia Schauer. Virtual Microbiology Class of the Science Prof Online website.
2. List of equipment in microbiology laboratory. Adana Science and Technology University-Bioengineering Department/ http://bioeng.adanabtu.edu.tr/upload/menu/doc/pdf.- p. 1-13

Key questions covered in lesson 4.

1. Morphology of bacteria,
2. Morphology of fungi,
3. Morphology of intracellular parasites (protozoa, rickettsia, mycoplasma, chlamydia, viruses.

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 14-15.
2. Warren Levinson Rewievof Medical Microbiology and Immunology /p. 29-32

Additional:

1. Bacterial Structure and Simple Stains https://www.hccfl.edu/media/stain.pdf.- p. 49
2. Simple Staining: Principle, Procedure and Results4.05/5(19)/ Microbe on line.
3. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014/p.65-67, 71-72, 75-78, 81-83

Key questions covered in lesson 5.

1. The structure of the microbial cell.
2. Complex stain methods
3. Intracellular inclusions, volutinous grains and their coloring.
4. Sporulation in bacteria, coloring spores.
5. Capsule detection methods. Motility of bacteria, motility test.

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 15, 27-28.
2. Warren Levinson Rewievof Medical Microbiology and Immunology /p. 23-43

Additional:

1. Medical-microbiology-microscopic-slides-and-media.pdf/ http://studymed.umed.pl/media/

Key questions covered in lesson 6.

1. The construction and use of the compound microscope is attributed to: - Antony van Leeuwenhoek
2. The foundation for the germ theory of disease was set down by - Louis Pasteur
3. The first man to use a simple microscope to observe microorganisms was: -Leeuwenhoek
4. The author of classification of bacteriology - Bergey
5. The individual best remembered for bringing microbes to the world is- Leeuwenhoek
6. Bacteriology is: -The branch of science concerned of the study of bacteria.
7. Classification of all living organisms divided? - Kingdom, phylum, class, order, family, genus, species
8. Which of the following best represents the hierarchy of levels of biological classification - Kingdom, phylum, class, order, family, genus, species
9. The scopes of microbiology are:- General, medical, sanitary, environmental
10. The science of microbiology is -The study of microorganism and their relationships to the world around them
11. What is Mycology? - Study of fungi
12. The study of form and structure of bacteria is - Morphology
13. Which of the following best represents the hierarchy of levels of biological classification? - Kingdom, phylum, class, order, family, genus, species
14. The binomial name of a microbe is composed of - Its genus name and a species modifier
15. The total magnification obtained, using the oil immersion objective and the *10 ocular, is: -* 1,000
16. On a compound light microscope the eyepiece is also called the- Ocular
17. Transfer instruments is___ - Wire loop
18. Most microbial structures and enzymes are composed of:- Proteins
19. Chemically the capsule may be: Either Polypeptide" or Polysaccharide
20. Which of the following structure is present in prokaryotic cells?-Mesosome
21. Bacteria having no flagella are unable to: - Move
22. Peptidoglycan is found only in the bacterial: - Cell Wall
23. Bacteria are: - Saprophytic
24. A single polar flagella is known as: - Monotrichous
25. Which of the following are prokaryotic? - Bacteriaandcyanobacteria
26. The location where the bacterial chromosome concentrates is called: - Nucleoid
27. Prokaryotic microorganism include: - Bacteria
28. Cellular microbes is: - Procaryotes(bacteria), eucariotes (algae,fungi,protozoa)
29. Bacteria move by means of: - Flagella
30. Genetic system is located in the prokaryotes in:All of these: - Nucleoid, Chromatin, Nuclear material.
31. Monotrichous organisms have: - One flagellum
32. A bacterium possessing flagella all around its cell is said to be: - Peritrichous
33. Cytoplasmic inclusions include: - All of these: Ribosomes, Mesosomes, Fat globules
34. A single polar flagella is known as:- Monotrichous
35. Which of the following structure is present in prokaryotic cells:-Mesosome
36. The structure responsible for motility of bacteria is: - Flagella
37. Single or clusters of flagella at both poles is known as: - Amphitrichous
38. A cluster of polar flagella is called: - Lophotrichous
39. Microcapsules are composed of:All of these: Proteins Polysaccharides Lipids
40. When flagella are distributed all-round the bacterial cell, the arrangement is known as: - Peritrichous

41. Mycoplasmas are different from the other prokaryotes by: - Absence of cell wall itself
42. The arrangement, in which flagella are distributed all round the bacterial cell, is known as: - Peritrichous
43. Which of the following does not contain protein: - Lipoteichoic acid
44. Flagella move the cell by: - Spinning like a propeller
45. Name the component of flagellum. - All of these Filament, Hook, Basal body
46. Peptidoglycan is found only in the bacterial: - Cell wall
47. Peptidoglycan is also known as: - Mureinmucopeptide
48. What is the function of bacterial capsule? - Both a)Production of organism from phagocytosis, b)Helps in adherence of bacteria to surface in its environment
49. Cytoplasmic inclusions include: - All of these Ribosomes Mesosomes Fat globules
50. Genetic system is located in the prokaryotes in: - All of theseNucleoid" Chromatin Nuclear material
51. A bacterium possessing flagella all around its cell is said to be: - Peritrichous
52. Taxonomy is: - The science that systematizes biological classification of living things
53. Which of the following does not contain protein? - Lipoteichoicacid
54. Chemotaxis is a phenomenon of:- Swimming away or towards of bacteria in presence of chemical compound
55. Swimming towards a chemical of bacteria is termed as -Positive chemotaxis
56. Optimal temperature for cultivation bacteria - 37Γ‚B°
57. Pathogenic microorganisms are -Capable of causing disease
58. Pathogenic organisms are- Disease-producing microorganisms
59. The method for separating bacteria in a mixed culture is -Streak plate method

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 14-15.
2. Warren Levinson Rewievof Medical Microbiology and Immunology /p. 29-32
3. *Additional:*
4. Medical-microbiology-microscopic-slides-and-media.pdf/ http://studymed.umed.pl/media/
5. Bacterial Structure and Simple Stains https://www.hccfl.edu/media/stain.pdf.- p. 49
6. Simple Staining: Principle, Procedure and Results4.05/5(19)/ Microbe on line.
7. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014/p.65-67, 71-72, 75-78, 81-83

Unit 2

Key questions covered in lesson 7.

1. Draw a typical bacterial growth curve and describe it.
2. What are the heterotrophic bacteria? Discuss the nutritional and physical requirements for the growth of the bacteria.
3. Write short notes on:
4. Bacterial growth curve/growth phases of bacteria.
5. What are culture media? Classify and discuss them briefly.
6. Distinguish between a selective medium and a differential medium.

Recommended reading for the lesson:

1. Surinder Kumar «Textbook of Microbiology» first edition, 2012/pages 32-39, 55-64.
2. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages21-23, 34-37.
3. Collee JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996:95-111
4. Anantharayan and Paniker's «Textbook of Microbiology» pages 34-38, 39-43.
5. Muhammad Firdaus «Microbiology» 4th edition, 2005/pages 8-12.
6. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages 38-39.
7. Surinder Kumar «Textbook of Microbiology» first edition, 2012/pages 64-65
8. Collee- JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996: 113-129
9. Anantharayan and Paniker's «Textbook of Microbiology» pages 39-43.

Key questions covered in lesson 8.

1. Types of microorganisms by oxygen requirements.
2. Obligate aerobes
3. Obligate anaerobes
4. Facultative anaerobes
5. Microaerophiles

Recommended reading for the lesson:

1. Surinder Kumar «Textbook of Microbiology» first edition, 2012/pages 73-81.
2. Collee JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996:131-149

3. Duerden BI, Towner KJ, Magee JT. Isolation, description and identification of bacteria. Topley and Wilson's Microbiology and Microbial Infections, Balows A, Sussaman M (Eds). vol 2, 9 edn, Arnold, London, Sydney, Auckland 1998;65-84.
4. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 8
5. Michel J. Leboffe, Morton Publishing Company/ Microbiology-Laboratory Theory and Application/ - 2010, p. 3-9
6. A Manual Basis Practical Microbiology, Society for General Microbiology, 2006/p. 1-5
7. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014.- p.6-8

Key questions covered in lesson 9.

1. Rules for the collection of biological material.
2. Methods of cultivation and isolation of pure cultures.
3. Methods of cultivation of aerobic and anaerobic bacteria.

Recommended reading for the lesson:

1. Subhash Chandra Pariga «Textbook of Microbiology&Immunology» 2nd edition, 2012/pages 38-39.
2. Surinder Kumar «Textbook of Microbiology» first edition, 2012/pages 66-68
3. Collee- JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996: 113-129
4. Anantharayan and Paniker's «Textbook of Microbiology» pages 34-38, 39-43.

Key questions covered in lesson 10.

1. Enzyms of bacteria, their classification.
2. Protein metabolism - the value and methods of study.
3. Enzymes of pathogenicity.
4. Pigment formation of bacteria, its value.

Recommended reading for the lesson:

1.Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages 85-89, 94-99, 122-124, 143-148.
2.Hawley, Louise. Microbiology and Immunology, 6th ed. / pages 238-257.
3.Anantharayan and Paniker's «Textbook of Microbiology» 7th ed. / pages 71-80, 152-158.
4.Medical Microbiology. 26th.edition, 2013, Jawetz, Melnick, & Adelberg's. - LANGE medical book.- p.123-124, 124-140, 142-143.

Key questions covered in lesson 11.

1. Studying the enzymatic activity of microorganisms (color series of Giss, MacConkeys medium).
2. Pigment formation of bacteria, its significance.
3. Differential diagnostic culture media, the principle of their work (Hiss, McConkie, Simons)
4. Differential and indicator media

Recommended reading for the lesson:

1.Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012/pages 85-89, 94-99, 122-124, 143-148.
2.Hawley, Louise. Microbiology and Immunology, 6th ed. / pages 238-257.
3.Anantharayan and Paniker's «Textbook of Microbiology» 7th ed. / pages 71-80, 152-158.
4.Medical Microbiology. 26th.edition, 2013, Jawetz, Melnick, & Adelberg's. - LANGE medical book.- p.123-124, 124-140, 142-143.
5.Kim Moscatello, Immunoogy and Microbiology, Kaplan Medical USMLE Step1, lecture notes,2013/ pages 2-22, 117-131.

Key questions covered in lesson 12.

1. Multiplication of bacteria and growth curve.
2. Nutritional types of microorganisms.
3. Culture media, ingredients of culture media, classification.
4. Methods for Culture.
5. Cultivation and isolation of pure cultures.
6. Description of different colony types
7. Types of microorganisms by oxygen requirements.
8. Cultivation of aerobic bacteria.
9. Cultivation of anaerobic bacteria.
10. Special culture techniques for anaerobic bacteria
11. Enzymes of bacteria, their classification.
12. Protein metabolism - the value and methods of study.
13. Enzymes of pathogenicity.
14. Pigment formation of bacteria, its value.

Recommended reading for the lesson:

1. Surinder Kumar «Textbook of Microbiology» first edition, 2012
2. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012

3. Collee JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996
4. Anantharayan and Paniker's «Textbook of Microbiology»
5. Muhammad Firdaus «Microbiology» 4th edition, 2005
6. Subhash Chandra Pariga «Textbook of Microbiology&Immunology»2nd edition, 2012
7. Surinder Kumar «Textbook of Microbiology» first edition, 2012
8. Collee- JC, et al. Mackie and McCartney Practical Medical Microbiology, 14th edn. London: Churchill Livingstone 1996

Unit 3

Key questions covered in lesson 13.

1. Morphology and ultrastructure of viruses.
2. Which of characteristics of life is/are present in viruses? Which is absent?
3. Be able to summarize the structural features of a bacteriophage virus.
4. Describe the differences between a retrovirus and a typical bacteriophage.
5. What are the consequences of a viral DNA becoming incorporated into a human egg or sperm cell?
6. What does reverse transcriptase do for a virus that has this enzyme?
7. Use the Internet to locate information about a virally caused human disease. What treatments are available?
8. Genetics, definition. Genetic information in microorganisms (DNA, RNA, gene, genome, replicon, etc.).

Recommended reading for the lesson:

Medical microbiology /F.H. Kayser,K.A., Beinz, J., Eckert, R.M.Zinkerlager. p. 34-40
Review Med. Microbiology and Immunology.10th ed. Genetics /Warren Levinson. - LANGE med. book. 525 p
Microbiology /Tamil Nadu Text Book Corporation, 1st Ed. 2004. p. 24.
Video films https://cloud.mail.ru/public/vjiH/Arzg78A89

Key questions covered in lesson 14.

1. Classify different methods of sterilization? What are various techniques used for isolation of pure culture?
2. What is sterilization? Classify different methods of sterilization?
3. What are various techniques used for isolation of pure culture?
4. What are sources of contamination in aseptic area?
5. What is the principle of the autoclave?
6. Aseptic, antiseptic.
7. WHO handwashing algorithm

Recommended reading for the lesson:

1. Alder VG, Simpson RA. Heat sterilization. A. Sterilization and disinfection by heat methods. Principles and Practice of Disinfection and Sterilization, 2nd edn, Russell AD, Hugo WB, Ayliffe GAJ, (Eds) Oxford: Blackwell Science, Oxford 1992: 483-98.
2. Ayliffe GAJ, Coats D, Hoffman PN. Chemical Disinfection in Hospitals, 2nd edn, Public Health Laboratory Service, London 1993.
3. Denyer SP. Filtration sterilization. Principles and Practice of Disinfection, Preservation and Sterilization, 2nd edn, eds Russell AD, Hugo WB, Ayliffe GAJ (Eds), Blackwell Science Oxford 1992: 573-604.
4. Gardner JF, Peel MM. Introduction to Sterilization and Disinfection, Edinburg: Churchill Livingstone, Edinburg 1991.
5. Russell AD, et al. Principles and Practice of Disinfection, Sterilisation and Preservation. 2nd edn. Oxford: Blackwell Scientific 1992.
6. Microbiology /Tamil Nadu Text Book Corporation, First Edition- 2004 - c. 24.
7. Medical microbiology p.34-40/F.H. Kayser,K.A., Beinz, J., Eckert, R.M.Zinkerlager
8. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- 525 p. 8
9. Video films https://cloud.mail.ru/public/vjiH/Arzg78A89

Key questions covered in lesson 15.

1. Infection, infectious process and forms.
2. Factors of virulence and pathogenicity of microorganisms and bacterial toxins..
3. Ways of transmitting microorganisms
4. Factors of virulence and pathogenicity of microorganisms

Recommended reading for the lesson:

1. Medical microbiology p.34-40/F.H. Kayser,K.A., Beinz, J., Eckert, R.M.Zinkerlager
2. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson. - LANGE med.book.- 525 p.c. 8
3. Microbiology /Tamil Nadu Text Book Corporation, First Edition- 2004 - c. 24.
4. Video films (ссылка на облако) https://cloud.mail.ru/public/vjiH/Arzg78A89

Key questions covered in lesson 16.

1. What are healthcare associated infections, nosocomial infections and hospital acquired infections?
2. What is the most important cause of nosocomial infections?
3. What is the mode of transmission of nosocomial infections?

4. Role of opportunistic pathogens in human pathology.
5. Mechanisms and factors of transmission of infectious agents. Forms of infections.
6. Hospital-acquired infections. Infection control.
7. Rules for collection, storage and transportation of clinical specimen.

Recommended reading for the lesson:

1. Review Med.Microbiology and Immunology.10th ed. Genetics /Warren Levinson.- LANGE med.book.- c. 14-15.
2. Warren Levinson Rewie of Medical Microbiology and Immunology /p. 29-32
3. Classification and Nomenclature of Human Parasites/ Lynne S. Garcia. Chapter 208. 2861-2866 p.
4. *Additional:*
5. Medical-microbiology-microscopic-slides-and-media.pdf/ http://studymed.umed.pl/media/
6. Bacterial Structure and Simple Stains https://www.hccfl.e+du/media/stain.pdf.- p. 49
7. Simple Staining: Principle, Procedure and Results4.05/5(19)/ Microbe on line.
8. James G. Cappuccino, Natale Sherman Microbiology: a laboratory manual, 10-th ed, 2014/p.65-67, 71-72, 75-78, 81-83

Key questions covered in lesson 17.

1. What are the general rules for collection and transportation of specimens?
2. What are the guidelines for specimen transport?
3. What are the principles of collection of specimens?
4. What are the four rules when collecting specimens?
5. What is the importance of proper specimen collection and transport?
6. How do you transport a clinical sample?
7. What are the various methods of collection of specimens from patients?
8. What are the objectives of sample collection?
9. What is the most important aspect of specimen collection?

Recommended reading for the lesson:

1. Principle of microbiology /Dr. M. S. Bhatia- p.43-52
2. AdMedical Microbiology. 28th Ed. Jawetz, Melnick, &Adelberg's.- LANGE medical book.- p. 769-770.

Key questions covered in lesson 18.

1. Sterilization (definition), methods of sterilization.
2. Disinfection (definition), methods of disinfection
2. Aseptic, antiseptic.
3. WHO handwashing algorithm.
4. Pathogenicity, virulence of bacteria and bacterial toxins.
5. Infection and its forms.
6. Nosocomial infection/Inpatient hospital infection.
7. Role of opportunistic pathogens in human pathology.
8. Mechanisms and factors of transmission of infectious agents. Forms of infections.
9. Hospital-acquired infections. Infection control.
10. Rules for collection, storage and transportation of clinical specimen.
11. Pathogenicity, virulence of bacteria and bacterial toxins.
12. Infection and its forms.
13. Nosocomial infection.
14. The role of opportunistic pathogens in human pathology.
15. Mechanisms and factors of transmission of infectious agents. Forms of infection.
16. Hospital-acquired infections. Infection control
17. Sterilization (definition), methods of sterilization.
18. Disinfection(definition), methods of disinfection
19. Aseptic, antiseptic.
20. Algorithm of hand washing according to WHO standards.
21. Rules of collection, storage and transportation of clinical specimen.

Methodological instructions for the implementation of independent work on the discipline:

1. Review assigned materials and recommended literature;
2. Read relevant literature and complete tasks and exercises outlined in the thematic plan of independent work;
3. Consult with the teacher in case of questions or for feedback on your work;
4. Reflect on your learning process and outcomes, identifying areas of strength and areas for improvement. This self-reflection can help enhance your understanding of the material and improve your performance in future assignments;
5. Conduct additional research or reading to deepen your understanding of the topic and broaden your knowledge in the subject area.